

- 1 1. A method comprising:
2 reducing the grain size of a phase change
3 material; and
4 reducing the crystallization time of the phase
5 change material.
- 1 2. The method of claim 1 wherein reducing the grain
2 size of the phase change material includes doping the
3 material with nitrogen.
- 1 3. The method of claim 2 wherein reducing the grain
2 size of the phase change material includes doping the
3 material with nitrogen and oxygen.
- 1 4. The method of claim 1 wherein reducing the
2 crystallization time of the phase change material includes
3 doping the phase change material with titanium.
- 1 5. The method of claim 4 including doping the phase
2 change material with ions of titanium.
- 1 6. The method of claim 5 including sputtering
2 titanium.

1 7. The method of claim 5 including ion implanting
2 titanium to reduce the crystallization time of the phase
3 change material.

1 8. The method of claim 4 including providing a layer
2 of titanium proximate to said phase change material.

1 9. The method of claim 8 including providing the
2 layer of titanium sufficiently proximate to the phase
3 change material that when the titanium is heated, titanium
4 diffuses into the phase change material.

1 10. The method of claim 9 including causing the
2 titanium to diffuse into the phase change material as a
3 result of heating during processing of the phase change
4 material.

1 11. A phase change material comprising:
2 a chalcogenide;
3 a species introduced into the chalcogenide
4 material to reduce grain size; and
5 a species introduced into the chalcogenide to
6 increase crystallization speed.

1 12. The material of claim 11 wherein said
2 chalcogenide includes $\text{Ge}_2\text{Sb}_2\text{Te}_5$.

1 13. The material of claim 11 wherein the grains of
2 the chalcogenide are less than approximately 10 nanometers.

1 14. The material of claim 11 wherein the species to
2 reduce grain size includes nitrogen.

1 15. The material of claim 11 wherein the species to
2 increase crystallization speed includes titanium.

1 16. A device comprising:
2 a substrate; and
3 a layer of chalcogenide material over said
4 substrate, said chalcogenide material including a species
5 to reduce the grain size of the chalcogenide material and a
6 species to increase the crystallization speed of said
7 chalcogenide material.

1 17. The device of claim 16 wherein said chalcogenide
2 material includes $\text{Ge}_2\text{Sb}_2\text{Te}_5$.

1 18. The device of claim 16 wherein the grains of the
2 chalcogenide material are less than approximately 10
3 nanometers.

1 19. The device of claim 16 wherein the species to
2 reduce grain size includes nitrogen.

1 20. The device of claim 16 wherein the species to
2 increase crystallization speed includes titanium.

1 21. The device of claim 16 wherein the device is a
2 semiconductor memory.

1 22. The device of claim 16 including an insulator
2 over said substrate and under said chalcogenide material.

1 23. The device of claim 22 including a heater
2 extending through said insulator to said chalcogenide
3 material to heat said chalcogenide material.

1 24. The device of claim 16 including titanium
2 containing layer under said chalcogenide material.

1 25. The device of claim 24 wherein said titanium
2 containing layer is sufficiently proximate to said
3 chalcogenide material that titanium may diffuse into the
4 phase change material upon heating.

1 26. A system comprising:
2 a processor-based device;
3 a wireless interface coupled to said processor-
4 based device; and

5 a semiconductor memory coupled to said device,
6 said memory including the substrate, said memory further
7 including a layer of chalcogenide material over said
8 substrate, said chalcogenide material including a species
9 to reduce the grain size of the chalcogenide material and a
10 species to increase the crystallization speed of said
11 chalcogenide material.

1 27. The system of claim 26 wherein the species to
2 reduce grain size includes nitrogen.

1 28. The system of claim 26 wherein the species to
2 increase crystallization speed includes titanium.

1 29. The system of claim 26 including an insulator
2 over said substrate and under said chalcogenide material.

1 30. The system of claim 29 including a heater
2 extending through said insulator to said chalcogenide
3 material to heat said chalcogenide material.